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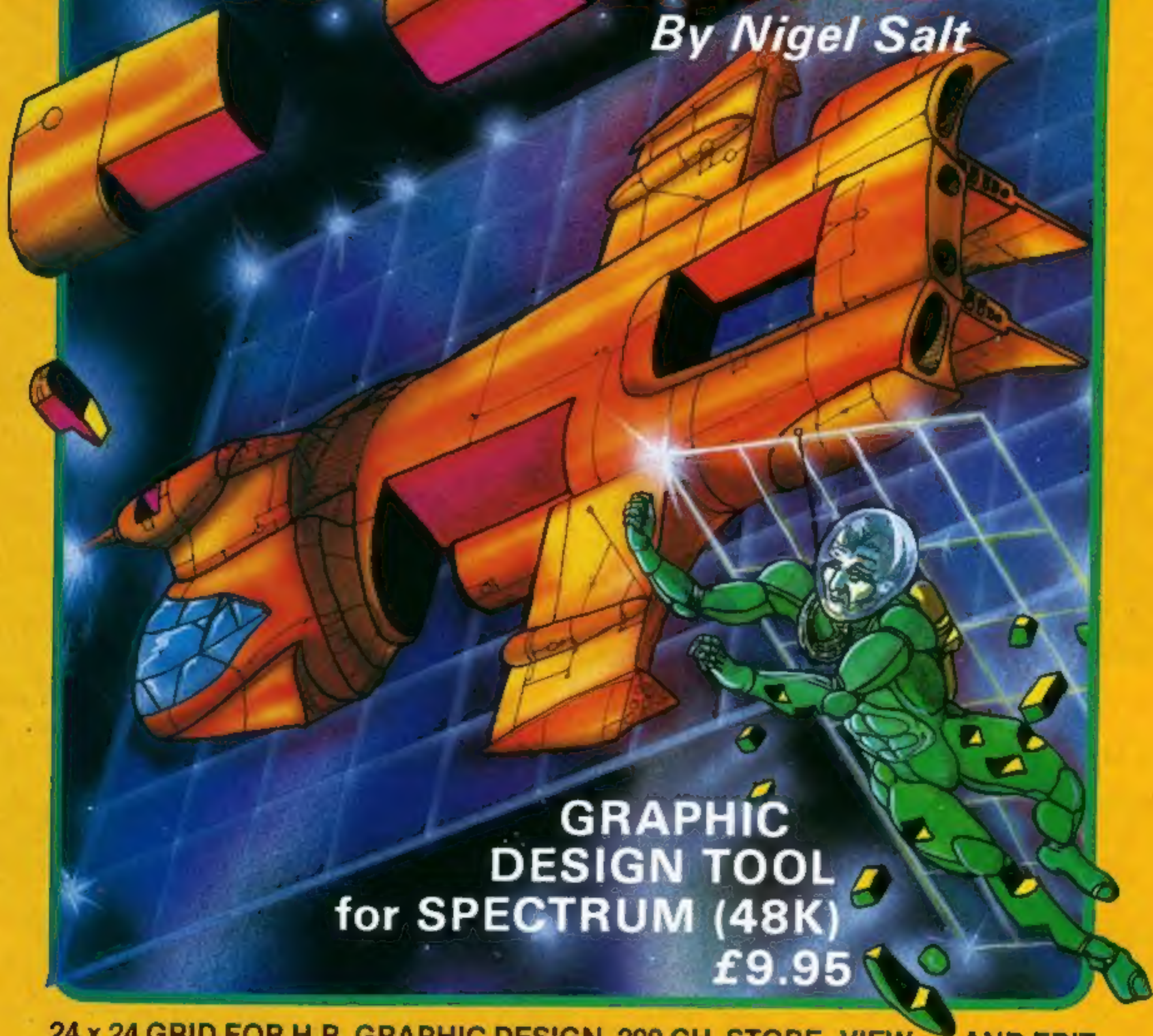
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*By Nigel Salt*



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WE WELCOME programs and articles from our readers. If you feel that your work meets our standards, please submit it to us for consideration for publication.

Programs must always be sent on cassette. Listings are helpful, but not necessary. Check carefully that they are bug-free. Include full details of what your program does, how it works, variables you have

used and hints on conversion. See the programs in this issue for guidance on what your paperwork should include.

Articles on using the Spectrum and the ZX81 should be no longer than 2,000 words. Those most likely to be published will help our readers make better use of their computers by giving useful advice, possibly with programming examples, tables and so on. Short hints are also welcome.

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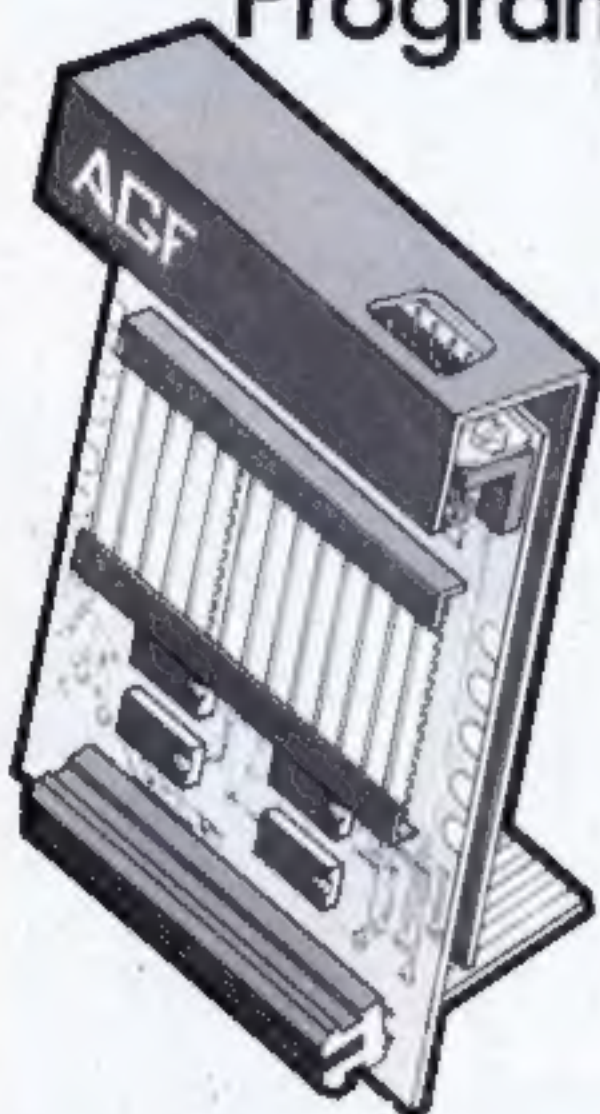


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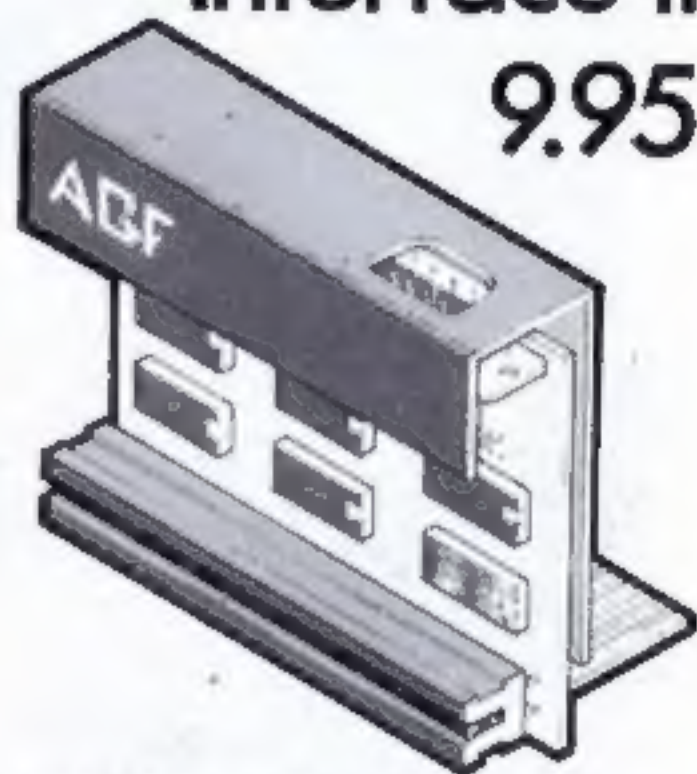
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# LET'S HAVE SOME

# FUN...

**Spiders, rabbits, ants and barbarians — they're all in this selection of Spectrum games, star-rated for you by our panel**

## Carnival

48K £5.95

Eclipse, 4 Oxford Rd, London N9 0NA

This is a version of the game of the same name that appeared in the arcades in 1980. It was designed to provide some relaxing fun in an arcade crowded with the interplanetary violence common then.

Almost an exact copy of the arcade version, it is the computer equivalent of the shooting gallery with three rows of moving targets — white rabbits, red owls and yellow ducks. There are also the letters B, O, N, U, S which give a bonus if hit in that order. At the top of the screen there are eight "pipes" — the spokes of a turning wheel.

You have limited bullets, so this is not a game for itchy-fingered space invaders players.

Sometimes the ducks fly down and eat 10 of your bullets, so be on your guard.

If you complete a screen there is a change to gain extra points by shooting bears. Circus music is played continuously. Thankfully this can be turned off by hitting a box marked with a quaver. Graphics are large and well designed, but there is little animation. The instructions are down-to-earth.

While not original, this is a nice game requiring a different strategy to many on the market.

M.T.

instructions	75%
playability	70%
graphics	65%
value for money	70%

★ ★ ★ ★

## Conquest

48K £6.95

Cheetahsoft, 24 Ray St, London EC1

This is a wargame, centred on a map of Europe, in which you must build an empire as quickly as possible.

The rules are quite complex but, instead of having to master them all at once, you are introduced to them slowly and can play the game at five preliminary levels before tackling the advanced game.

On the first level you must cope with barbarian attacks; on the second, civil wars; then assassinations; on the fourth there are rival empires, but may build forts; on the fifth level you must cope with plagues and finally on the advanced level you may build ports and have sea

movement as well as land. The instructions, on a separate program on the other side, are very clear and maps are included to illustrate various points. I only needed to read them once in order to play. One disadvantage is you must reload them and then the game if you wish to change level, but the game can be loaded without the instructions.

Very well thought out and easy to grasp in spite of its complexity. An excellent introduction to wargaming for the novice and well worth buying for the expert.

M.T.

instructions	90%
playability	70%
display	75%
value for money	70%

★ ★ ★ ★

## Matrix

£6.95

Salamander, 17 Norfolk Rd, Brighton, East Sussex BN1 3AA

Another conversion from an original by the imaginative Jeff Minter, this takes the form of an outer space ballet between you and the Droids. The action takes place on a constantly shifting grid, or matrix. And what action! Not only are you fighting the Droids, but they are reinforced with Pods and Zappers and, would you believe, Cameloids.

As if that wasn't enough there is a Snitch, a treacherous human who acts as a spotter for the Zappers. Some of the levels have deflexors which, as the name suggests, deflect your own fire.

Pods are another menace,

they are formed at the intersection of the Zappers' cross fire. When a Pod is formed it is a good policy to shoot them down, otherwise they can mutate into nasties, and drop down on you. The Droids are the real villains of the piece though. When you hit them they break into segments, which also form Pods. Occasionally they will drop bombs on you, and when they reach the bottom of the screen they start to track you.

An excellent game, plenty of action, and good graphics.

B.B.

instructions	100%
playability	100%
graphics	90%
value for money	100%

★ ★ ★ ★ ★

## Antics

48K £5.95

Bug-Byte, Mulberry House, Canning Place, Liverpool L1 8JB

This is the sequel to the much acclaimed Birds and the Bees. The idea is to enter an ants' nest to rescue Boris — the star of the original — and discover the secret message, while avoiding the nasties.

The game features the same high quality cartoon graphics (it's written by the same author). Sound effects, which can be turned off, are excellent. Toccata, made famous by Sky, is played continuously while other sound effects appear simultaneously as if the Spectrum had more than one sound channel!

The nest is a massive maze

covering many screens. I don't know how many there are, but I've been through at least 20 and I don't think I've got anywhere yet — I certainly haven't found Boris or the secret message!

One criticism: if you get a high score you must enter your name using only the left, right and fire controls. This was a clever way to enter letters on arcade machines, but pointless when Uncle Clive has gone to so much trouble to give us a keyboard.

Very addictive and amusing — far better than the original.

M.T.

instructions	70%
playability	90%
graphics	85%
value for money	85%

★ ★ ★ ★ ★

## Metagalactic Llamas...

48K £6.95

Salamander, 17 Norfolk Rd, Brighton, East Sussex BN1 3AA

Set in a period beyond the 24th century, this game is converted from Jeff Minter's original. It's pure science fiction stuff, and, like all good science fiction stories, there is a slightly bizarre element woven into it.

But, could it happen, could genetic engineering of the future create arachnid mutants capable of handling laser weapons? And could the answer be a Llama which spits death and destruction?

The mutant arachnids, in this case spiders, descend on a strand of web from behind a kind of force field, which can be raised, or lowered by you. The

Llama spits death upwards and the fire is deflected by the force field, hopefully destroying the descending arachnids before they can land. When they do land they turn into what are called disgusting Weeviloids, which look, and act, like caterpillars, which then crawl inexorably towards the Llama.

There are 99 levels of play, of which the first 32 are selectable.

Very high quality, and could turn out to be an addictive game. Keys are re-definable and there are plenty of instructions.

B.B.

instructions	100%
playability	100%
graphics	100%
value for money	90%

★ ★ ★ ★ ★



# GHOULIES and GHOSTIES

The object of this game is to retrieve the Magic Orb from the haunted house without being caught by its unfriendly occupants.

You must collect a treasure from each room in order to gain access to the next. You have three lives; one is lost each time you are caught by a monster. If you reach the final room you will see two orbs — only one is real. If you take the

## How it works

The program listing, although long, is quite straightforward. There is a short main play loop with calls to subroutines as the game progresses. The main loop moves the man and makes calls to one of 10 monster move routines. If a treasure is collected the next door opens and when the man is next to the open door the appropriate move to next room

routine is called. These sub-routines blank out the man and monsters in the current room and re-set variables ready to start play in the following room. The program then reverts to a move man/move monster loop.

There are three screens and these are called as the man reaches the final door on the current screen. During a screen call new graphic characters are set up to produce a fresh set of monsters and treasures.

Other minor subroutines cover tune, title, instructions, select orb and end of game.

*Watch out for things that go bump in the night as you find your way through the haunted house, written by Peter Watson. Spooks and spectres are after your blood so hurry to find the treasure!*

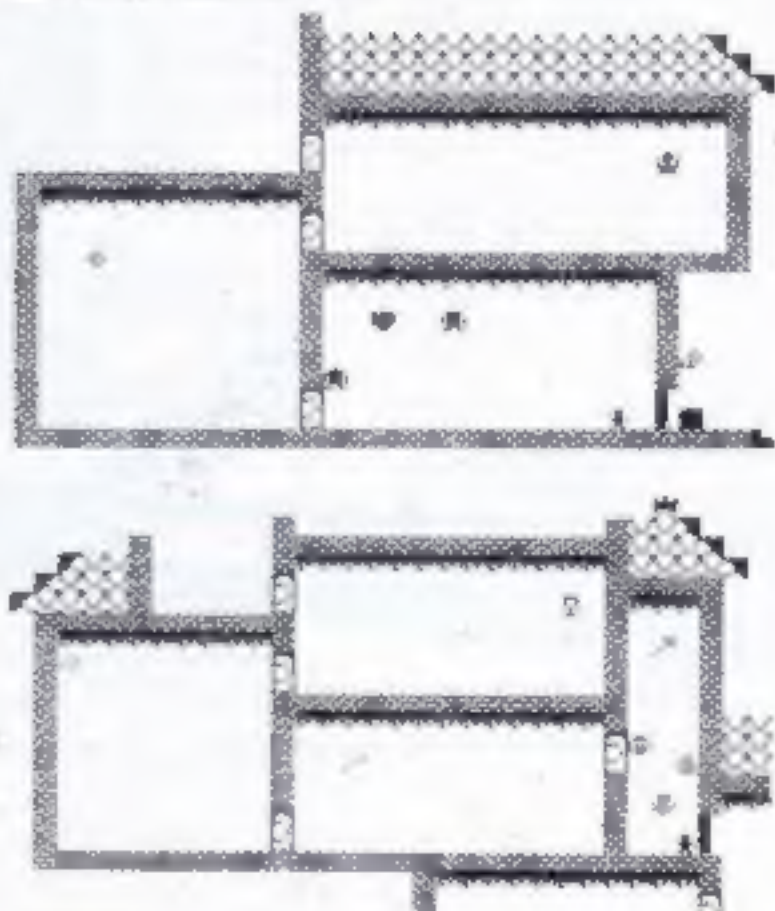
Screen dumps for The House

wrong one you are dead, and the game is over.

A status report is given at the bottom of the screen, showing the room reached and lives left.

## Controls

- 5 move left
- 6 move down
- 7 move up
- 8 move right





## Variables

**x,y** horizontal and vertical co-ordinated of man  
**xl,xr** left and right horizontal limits for man movement  
**yu,yd** up and down vertical limits for man movement  
**p,q** horizontal and vertical co-ordinates of monster(s)  
**z** number of monster move arrays, i.e. p(z) where z = 1, 2, 3 etc  
**d** duration of notes in signature tune  
**room** current room number  
**lives** lives left  
**t** random number generated when taking orb

Since the listing is long it is best to type in several sub-routines; SAVEing them on tape as you go, thereby avoiding any possible disasters. The program should be finally saved in the auto-run mode using the command: SAVE "house" LINE 1, and then verified.

If the program is run then listed it will be found that the monsters and treasures appear in the wrong monster sub-routines. This is simply due to the way the graphic characters are called during the game.

Enter the letters between quotation marks in graphics mode except where they form words.

```

1 REM THE HOUSE
2 REM Peter Mason
10 PAPER 0: INK 3: BORDER 0: CLS
20 GO SUB 8300: GO SUB 9000
30 DIM p(4): DIM q(4)
40 LET p(1)=20: LET p(2)=15: LET q(1)=15: LET q(2)=18
50 LET a1=28: LET x=30: LET y=20: LET yd=20
60 LET lives=3: LET room=0: LET c=0
70 PRINT 90: AT 1,0: INK 4: "Room 0 Lives "lives
80 GO SUB 3010
100 REM Move man
110 LET x=28: LET y=20
120 LET a=1: LET b=y
130 LET a=a+(INKEY="D" AND a<21)+(INKEY="B" AND a<19)
140 LET y=y+(INKEY="7" AND y<19)+(INKEY="A" AND y<17)
150 IF a<18 OR b<17 THEN PRINT AT b,a: " "
160 IF ATTR (y,a)=7 THEN GO SUB 4950: room=50
170 IF ATTR (y,a)=4 THEN GO SUB 7010
180 PRINT AT y,a: INK 6: "D"
190 GO SUB 200: room
195 GO TO 120
200 REM Room 1
210 IF ATTR (y,a)=11 AND THEN GO TO 3200
220 FOR z=1 TO 2
230 PRINT AT q(z),p(z): " "
240 LET p(z)=p(z)+1: LET q(z)=q(z)+1
250 IF ATTR (q(z),p(z))=6 THEN GO SUB 7010
260 PRINT AT q(z),p(z): INK 2: BRIGHT 1: "D"
270 IF p(z)=15 OR p(z)=28 THEN LET p(z)=q(z)
280 IF q(z)=14 OR q(z)=20 THEN LET q(z)=p(z)
290 NEXT z
300 BEEP .01,50
310 RETURN
400 REM Room 2
450 IF ATTR (y,a)=1 AND THEN

```



```
1 REM *****
2 REM Peter Nelson
10 PAPER 0: INK 3: BORDER 0: CLS
20 GO SUB 8500: GO SUB 9000
30 DIM p(1): DIM q(1)
40 LET p(1)=20: LET p(2)=15: LET q(1)=15: LET q(2)=18
50 LET x=28: LET x=30: LET y=20: LET y=20
60 LET lives=3: LET room=0: LET c=0
70 PRINT @: AT 1,0: INK 4: Room 0 Lives "lives"
80 GO SUB 3010
100 REM Move man
110 LET x=24: LET y=20
120 LET a=1: LET b=y
130 LET x=x-1: INKEY="S" AND x>1: INKEY="B" AND x<1
140 LET y=y-1: INKEY="7" AND y>1: INKEY="4" AND y<1
150 IF a<7 OR b<7 THEN PRINT AT b,a: " "
160 IF ATTR (y,x)=7 THEN GO SUB 4900+room*30
170 IF ATTR (y,x)=4 THEN GO SUB 7010
180 PRINT AT y,x: INK 4: "C"
190 GO SUB 300+room
195 GO TO 120
200 REM Room 1
210 IF ATTR (y,x-1)=4 THEN GO TO 3200
220 FOR z=1 TO 2
230 PRINT AT q(z),p(z): " "
240 LET p(z)=p(z)+1: LET q(z)=q(z)+1
250 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
260 PRINT AT q(z),p(z): INK 2: BRIGHT 1: "C"
270 IF p(z)=13 OR p(z)=24 THEN LET p(z)=p(z)-1
280 IF q(z)=14 OR q(z)=20 THEN LET q(z)=q(z)-1
290 NEXT z
300 BEEP .01,50
310 RETURN
400 REM Room 2
410 IF ATTR (y,x+1)=4 THEN GO TO 3400
420 FOR z=1 TO 4
430 PRINT AT q(z),p(z): " "
440 LET p(z)=p(z)+1: LET q(z)=q(z)+1
450 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
460 PRINT AT q(z),p(z): INK 2: BRIGHT 1: "C"
470 IF p(z)=1 OR p(z)=11 THEN LET p(z)=p(z)+1
480 IF q(z)=10 OR q(z)=20 THEN LET q(z)=q(z)+1
490 NEXT z
500 BEEP .01,50
510 RETURN
600 REM Room 3
610 IF ATTR (y,x-1)=7 THEN GO TO 3600
620 PRINT AT q,p: " "
630 LET q=q+1: LET p=p+1: LET c=c+1
640 IF ATTR (q,p)=4 THEN GO SUB 7010
650 IF c=3 THEN PRINT AT q,p: INK 3: "D": BEEP .1,-20
660 IF c=7 THEN LET c=1
670 IF q=6 OR p=11 THEN LET q=p-q
680 IF p=13 OR p=29 THEN LET p=p-4
690 BEEP .005,50
700 RETURN
800 REM Room 4
810 IF ATTR (y,x-1)=67 THEN GO TO 3800
820 FOR z=1 TO 3
830 PRINT AT q(z),p(z): " "
840 LET q(z)=q(z)+1
850 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
860 PRINT AT q(z),p(z): INK 2: BRIGHT 1: "C"
870 IF q(z)=9 OR q(z)=16 THEN LET q(z)=q(z)-1
880 NEXT z
890 BEEP .01,50
900 RETURN
1000 REM Room 5
1010 IF ATTR (y,x-1)=49 THEN GO TO 4000
1020 FOR z=1 TO 2
1030 LET u=(p(z)-13)-(q(z)-23)+p(z)+15 AND p(z)+33
1040 LET v=(q(z)-13)-(q(z)-18)+u*(q(z)+13 AND q(z)+18)
1050 PRINT AT q(z),p(z): " "
1060 IF RND>.3 THEN LET p(z)=p(z)+v
1070 IF RND>.3 THEN LET q(z)=q(z)+u
1080 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
1090 PRINT AT q(z),p(z): INK 3: "D"
1100 NEXT z
1110 BEEP .01,50
1120 RETURN
1200 REM Room 6
1210 IF ATTR (y,x+1)=70 THEN GO TO 4200
1220 LET z=INT (RND*8)+1
1230 PRINT AT q(z),p(z): " "
1240 IF x>p(z) THEN LET p(z)=p(z)+1
1250 IF x<p(z) THEN LET p(z)=p(z)-1
1260 IF y>q(z) THEN LET q(z)=q(z)+1
1270 IF y<q(z) THEN LET q(z)=q(z)-1
1280 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
1290 PRINT AT q(z),p(z): INK 3: "D"
1300 BEEP .01,50
1310 RETURN
1400 REM Room 7
1410 IF ATTR (y,x-1)=68 THEN GO TO 4400
1420 FOR z=1 TO 6
1430 PRINT AT 4+z,p(z): " "
1440 LET p(z)=p(z)-1
1450 IF p(z)=11 THEN LET p(z)=22
1460 IF ATTR (14+z,p(z))=4 THEN GO SUB 7010
1470 PRINT AT 4+z,p(z): INK 4: "E"
1480 NEXT z
1490 BEEP .01,50
1500 RETURN
1600 REM Room 8
1610 IF ATTR (y,x+1)=67 THEN GO TO 4600
1620 FOR z=1 TO 3
1630 PRINT AT 10+z,p(z): " "
1640 LET p(z)=p(z)+1
1650 IF p(z)=6 OR p(z)=2 THEN LET p(z)=p(z)-1
1660 IF ATTR (10+z,p(z))=4 THEN GO SUB 7010
1670 PRINT AT 10+z,p(z): "D"
1680 NEXT z
1690 BEEP .01,50
1700 RETURN
1800 REM Room 9
1810 IF ATTR (y,x+1)=66 THEN GO TO 4800
1820 IF RND>.4 THEN GO TO 1880
1840 LET p=B*INT (RND*3)
1850 LET q=B*INT (RND*3)
1860 IF ATTR (q,p)=4 THEN GO SUB 7010
1870 PRINT AT q,p: INK 4: "E"
1880 BEEP .01,50: BEEP .01,40: BEEP .01,40
1890 RETURN
2000 REM Room 10
2010 IF y=8 THEN GO SUB 2140
2020 NEXT z
2030 IF ATTR (y-3,x)=7 THEN GO TO 2200
2040 FOR z=1 TO 4
2050 PRINT AT q(z),p(z): " "
2060 LET p(z)=p(z)+1: LET q(z)=q(z)+1
2070 IF ATTR (q(z),p(z))=4 THEN GO SUB 7010
```

```
2080 PRINT AT q(z),p(z): INK 3: "D"
2090 IF p(z)=14 OR p(z)=20 THEN LET p(z)=p(z)-1
2100 IF q(z)=9 OR q(z)=12 THEN LET q(z)=q(z)-1
2110 BEEP .01,50
2120 RETURN
2130 REM Warning
2140 PRINT AT 1,25: PAPER 2: INK 4: FLASH 1: "BOMME"
2170 PRINT AT 3,24: INK 4: "Only one": AT 4,25: "Orb is": AT 5,25: "real !"
2180 BEEP .5,-10: BEEP .5,-10: BEEP .5,-20
2190 RETURN
2200 REM Select Orb
2210 LET t=16-INT (RND*2)+2
2220 IF x=t THEN PRINT AT 8,24: PAPER 0: INK 3: "CORRECT": BEEP .1,70: BEEP .1,3
0: BEEP .1,40: PRINT AT 5,t: INK 0: "X": PRINT AT 10,24: INK 3: BRIGHT 1: FLASH 1
1: "The Orb "AT 11,24: "is yours": PAUSE 150: GO SUB 7100
2230 IF c<4 THEN PRINT AT 8,24: PAPER 0: INK 3: "WRONG ": BEEP .3,0: BEEP .3,0
: BEEP .5,-3
2240 PRINT AT 10,24: INK 3: BRIGHT 1: "Aha, you": AT 11,24: "are "AT 11,28: FLASH 1: "DEAD"
2250 PRINT AT y,x: FLASH 1: INK 3: BRIGHT 1: "D": PAUSE 10: PAUSE 150: PRINT AT y
,x: PAPER 3: INK 4: FLASH 1: "O": PAUSE 150: PRINT AT y,x: INK 0: "X": GO SUB 710
0
3000 REM Outside House
3010 PRINT AT 20,28: INK 4: "C"
3020 PAUSE 75: BEEP .005,30: PAUSE 30: BEEP .005,30: PAUSE 30: BEEP .005,30: PAU
SE 20
3030 PAUSE 75: PRINT AT 17,28: INK 4: BRIGHT 1: "L": BEEP .05,50
3040 PAUSE 30: BEEP .2,-30: PRINT AT 19,27: INK 7: BRIGHT 1: "B": AT 20,27: "B"
3050 PAUSE 30: PRINT AT 20,28: INK 0: "X"
3060 LET v=room+1
3070 PRINT @: AT 1,3: INK 4: room
3080 LET x=24: LET y=20
3090 LET z=13: LET cr=30: LET yr=14: LET yb=20
3100 RETURN
3200 REM Room 1 to 2
3210 PRINT AT q(z),p(z): INK 0: "X": AT q(z),p(z): "X"
3220 GO SUB 4000
3230 LET x=1: LET y=20: PRINT AT y,x: INK 4: "D"
3240 LET p(z)=4: LET q(z)=4: LET p(z)=2: LET p(z)=10: LET q(z)=18: LET q(z)=18:
LET q(z)=18: LET q(z)=10
3250 LET x=1: LET x=11: LET y=10: LET y=20
3260 GO TO 120
3400 REM Room 2 to 3
3410 PRINT AT q(z),p(z): INK 0: "X": AT q(z),p(z): "X": AT q(z),p(z): "X": AT q(z),p
(z): "X"
3420 GO SUB 4000
3430 LET x=13: LET y=11: PRINT AT y,x: INK 4: "D"
3440 LET q=7: LET p=15
3450 LET x=13: LET y=20: LET y=6: LET y=11
3460 GO TO 120
3470 RETURN
3600 REM Room 3 to 4
3610 PRINT AT q,p: INK 0: "X"
3620 GO SUB 4000
3630 GO SUB 9100
3640 LET x=28: LET y=18: PRINT AT y,x: INK 4: "D"
3650 LET p(z)=24: LET q(z)=37: LET p(z)=28: LET q(z)=9: LET q(z)=12: LET q(z)=13
3660 LET x=24: LET y=28: LET y=7: LET y=18
3670 GO TO 120
3800 REM Room 4 to 5
3810 PRINT AT q(z),p(z): INK 0: "X": AT q(z),p(z): "X": AT q(z),p(z): "X"
3820 GO SUB 4000
3830 LET x=24: LET y=14: PRINT AT y,x: INK 4: "D"
3840 LET p(z)=14: LET p(z)=22: LET q(z)=17: LET q(z)=14
3850 LET v=1: LET w=1
3860 IF RND>.4 THEN LET p=23
3870 LET x=17: LET x=24: LET y=18: LET y=13
3880 GO TO 120
4000 REM Room 5 to 6
4010 PRINT AT q(z),p(z): INK 0: "X": AT q(z),p(z): "X"
4020 GO SUB 4000
4030 LET x=10: LET y=18: PRINT AT y,x: INK 4: "D"
4040 LET p(z)=4: LET p(z)=7: LET p(z)=10: LET p(z)=2: LET p(z)=2: LET q(z)=9: LE
T q(z)=9: LET q(z)=9: LET q(z)=13: LET q(z)=18
4050 LET x=2: LET y=10: LET y=9: LET y=18
4060 GO TO 120
4200 REM Room 6 to 7
4210 PRINT AT q(z),p(z): INK 0: "X": AT q(z),p(z): "X": AT q(z),p(z): "X": AT q(z),p
(z): "X": AT q(z),p(z): "X"
4220 GO SUB 4000
4230 LET x=12: LET y=10: PRINT AT y,x: INK 4: "D"
4240 DIM t(6)
4250 LET p(z)=21: LET p(z)=14: LET p(z)=17: LET p(z)=20: LET p(z)=13: LET p(z)=1
8
4260 LET x=12: LET y=24: LET y=0: LET y=10
4270 GO TO 120
4400 REM Room 7 to 8
4410 PRINT AT 3,p(z): INK 0: "X": AT 4,p(z): "X": AT 7,p(z): "X": AT 8,p(z): "X": AT 9
,p
(z): "X": AT 10,p(z): "X"
4420 GO SUB 4000
4430 GO SUB 9300
4440 LET x=4: LET y=18: PRINT AT y,x: INK 4: "D"
4450 LET p(z)=2: LET p(z)=4: LET p(z)=4: LET p(z)=3: LET p(z)=5
4460 LET x=3: LET y=4: LET y=0: LET y=18
4470 GO TO 120
4600 REM Room 8 to 9
4610 PRINT AT 11,p(z): INK 0: "X": AT 12,p(z): "X": AT 13,p(z): "X": AT 14,p(z): "X":
AT
15,p(z): "X"
4620 GO SUB 4000
4630 LET x=8: LET y=13: PRINT AT y,x: INK 4: "D"
4640 LET x=8: LET y=13: LET y=7: LET y=14
4650 GO TO 120
4800 REM Room 9 to 10
4810 FOR c=0 TO 11
4820 PRINT AT c,8: INK 0: "X"
4830 NEXT c
4840 GO SUB 4000
4850 LET x=14: LET y=14: PRINT AT y,x: INK 4: "D"
4860 LET p(z)=17: LET p(z)=14: LET p(z)=19: LET p(z)=14: LET q(z)=9: LET q(z)=10
: LET q(z)=11: LET q(z)=12
4870 LET x=14: LET y=20: LET y=6: LET y=14
4880 GO TO 120
5000 REM Take Treasure 1
5010 GO SUB 4300
5020 PRINT AT 19,12: INK 4: BRIGHT 1: "E": AT 20,12: "E"
5030 RETURN
5050 REM Take Treasure 2
5060 GO SUB 4300
5070 PRINT AT 10,12: INK 3: BRIGHT 1: "E": AT 11,12: "E"
5080 RETURN
5100 REM Take Treasure 3
5110 GO SUB 4300
5120 PRINT AT 4,12: INK 4: BRIGHT 1: "E": AT 7,12: "E"
5130 RETURN
5150 REM Take Treasure 4
5160 GO SUB 4300
```







A colourful game with features you can experiment with.

The scenery for Camel Race is produced very simply with seven triangles and two graphics characters. How is it done? Enter the program, and RUN it. You are a wealthy Arab betting on the result of a camel race in the desert. First appears the request: 'Which camel do you bet on?' Having chosen one, you are asked how much of your £1000 you will bet. Place your bet, enter it, and the race is on.

Now set the scene. The waters of the Nile come first, made from a single character in line 25, and placed in position by a FOR-NEXT loop in line 70. The sky is just as easy, being made in line 30, and used in line 75.

Then come three pyramids. Each is made with just one line: 105, 110 and 115. Study the arrangement of the PLOT and DRAW commands in each one. It is these which give rise to the different shapes. Take one of the lines to the bottom for editing, give it the number 5000 (so that it will be well clear of the game listing), and then CLS the screen. Now, RUN 5000 to print a triangle on the screen. List 5000, and try altering the value of the + and - signs. Swap them around (one at a time, or else you won't know what causes the difference).

All seven of the triangles - three for the pyramids, and four for the boat and sail - are variations on that same command, produced by altering the PLOT DRAW commands. The FOR command will alter the size of the triangle. Here are a couple to try: 5000 FOR X = 0 TO 40: PLOT 40+X,38: DRAW -X\*2, +X\*2: NEXT X. RUN 5000.

# RACE ON THE NILE

Place your bets on your favourite  
W. Simister explains the graphics  
in detail, and gives you the  
chance to experiment



The triangle leans to the left. Alter PLOT to 80+X,38: and DRAW to +X\*2,+X\*2. It is moved over, and now leans to the right. PLOT moved it, and the change of - to + in DRAW shaped it to the right. Keep experimenting, trying to understand what causes the changes each time. Make notes, and you will have a very

powerful tool to help you with programming. Incidentally, if you add STEP 4 on to the end of the FOR X = section, you will get a better idea of which way the lines are drawn.

When the scene is set the four camels appear and start to race. Use BREAK and CAPS SHIFT to halt them (CONT will cause them to continue). The

camel is a double graphic made in lines 10,15, and 20. Its four colours are set by the variable a\$ in line 5. Note the spacing of this string: "black (no space) blue (1 space) red (2 spaces) mauve". This allows each colour to have five characters in the string.

The camels are placed in their position by line 210, by the PRINT AT command: f\*1 +3. This line is another for you to study. Make sure your program has been taped (and verified) so that you won't lose it, and then try altering that one command to: f\*2 +2 or f\*4 or f\*2 or f\*1.

You cannot bring this line away from the program for testing because it would then be without its variable. Each command alters the position on the screen and the distance apart of the camels. After each change RUN the program again, and BREAK when the camels have started to move. f\*2+2 spreads them out, and one of the camels is in the water. f\*4 is even worse, for two camels are in the water. f\*2 is better, but they are still too far apart, with one camel in the sky. f\*1 is better for spacing, but they are all too high. This is where the additional +2 comes in. Add +1 first. Still too high, isn't it? Make it +5 just to see what is going on. Far too low. Now we know. In that small f\*1+3 statement the first number (1) spaces them out, and the second (3) alters their position as a group up or down.

Experiments like these will teach you a lot, so with every program you have safely taped, try some more. Find out what makes everything happen, and you will be well on the way to becoming a real programmer.

```

1 REM Camel Race
2 POKE 23409,200
3 HEADER 3: PAPER 6: BRIGHT 1: CLS
5 LET a$="blackblue red mauve"
10 FOR i=1 TO 3: FOR q=0 TO 7: READ a: POKE USR CHR$(143+i)+q,a: NEXT q: NEXT i
15 DATA 3,15,15,31,28,36,36,54
20 DATA 134,207,237,252,104,40,36,54
25 FOR x=0 TO 7: READ y: POKE USR "3"+x,y: NEXT x: DATA 0,0,60,195,0,0,60,195
30 FOR x=0 TO 7: READ y: POKE USR "1"+x,y: NEXT x: DATA 85,0,170,0,85,0,170,0
REM T
40 RANDOMIZE
50 GO TO 1000
65 INK 0: PRINT AT 0,0:"Camel race"
70 FOR x=9 TO 20: FOR y=0 TO 31: PRINT AT x,y:" " : NEXT y: NEXT x: REM water
75 FOR x=1 TO 2: FOR y=0 TO 31: PRINT AT x,y:"I" : NEXT y: NEXT x: REM Sky
100 INK 1: FOR x=20 TO 0 STEP -1: PLOT 206-x,x-166: DRAW x+2,0: NEXT x: REM Pyr
amid
110 INK 1: FOR x=12 TO 0 STEP -1: PLOT 168-x,x-160: DRAW x+2,0: NEXT x: REM Pyr
amid
115 INK 1: FOR x=8 TO 0 STEP -1: PLOT 250-x,x-150: DRAW x+2,0: NEXT x: REM Pyr
amid
120 INK 1: FOR x=0 TO 20: PLOT 25+x,x-29: DRAW x+2,0: NEXT x: REM Boat Hull
125 INK 1: FOR x=20 TO 0 STEP -1: PLOT 147-x,x-29: DRAW -x+2,0: NEXT x: REM Boat
Hull
130 INK 1: FOR x=0 TO 12: PLOT 80-x+2,5,x+9: DRAW x+7,0: NEXT x: REM Boat Hull
135 INK 1: FOR x=0 TO 40: PLOT x+70,24: DRAW -x+2,0+x+7: NEXT x: REM Boat Sail
140 INK 1: PLOT 58,8: DRAW 24,72: REM Boat Mast
145 PLOT 248,144: DRAW 0,-32
150 DIM x(4)
160 PRINT AT 25,1:"You bet 9:bet:" ON "148(1)+5-4 TO ch=3"
200 FOR i=1 TO 4: BEEP .005,2: BEEP .005,-5
210 INK 1: PRINT AT i+3,4:("1")CHR$(144)CHR$(145)
220 LET x(i)=i)+RND*1.5
230 IF x(i)>28 THEN GO TO 500
240 NEXT i
250 GO TO 300
300 INK 0: PRINT AT 3,1:"Race over. "
310 PRINT AT 4,1:"The "148(1)+5-1 TO (40):" camel wins."
320 FOR q=1 TO 24: BEEP .2,0-3: NEXT q
330 BEEP 1,20
400 CLS
410 IF ch=1 THEN GO TO 700
420 PRINT "You lose your bet...."
430 LET cash=cash-bet: IF cash>0 THEN GO TO 800
440 PRINT "You have no money left-you lose.": PRINT AT 10,4:"Enter RUN to try a
gain."
450 STOP
700 PRINT "Your bet has paid off!!!!!"
710 PRINT "You win 9:3bet"
720 LET cash=cash+3*bet
730 IF cash>5000 THEN GO TO 900
800 PRINT "You now have 9:cash"
810 GO TO 1020
900 PRINT "You have now assessed 9:cash"
910 PRINT "and you can afford to buy your own racing camel."
920 LET c$="967676545432111"
930 FOR i=1 TO 15: BEEP .2,VAL c$(i): NEXT i
940 STOP
1000 LET Cash=1000
1010 INK 0: PRINT "You have 91000"
1020 PRINT "Which camel do you bet on?"
1030 FOR i=1 TO 4
1040 PRINT "1)...148(1)+5-4 TO (45)
1050 NEXT i
1100 INPUT ch
1110 PRINT "How much do you bet?"
1120 INPUT bet: IF bet<cash THEN LET bet=cash
1130 CLS : GO TO 65
    
```



# GET YOUR SUMS



**Use Tom Langford's spreadsheet to work out your home accounts. It takes the hard graft out of mental arithmetic**

This is a complete spreadsheet program for the ZX 81 with extra RAM. It is adapted from a CROMEMCO 32K version which emphasises formula manipulation — a welcome change from other spreadsheets with fancy displays but poor figure handling. You can use this package for your home accounts. If you are an engineer, radio ham, scientist or student you will find this program particularly interesting and useful. Read the instructions carefully before you begin as it is quite complex.

**Variables**  
**V** allows entry of figures down a column. Column must already be on display  
**FORM** enters formula. The results of this are printed in the column specified  
**RR** recalculates table if an alteration has been made to the figures  
**HEAD** allows entry of a heading over a specified column. Heading must be 6 characters  
**CC** changes column spacing by specifying how many columns are to be put on display

**CH** changes a value into a column  
**SUM** finds the sum of all values in a specified column and prints them below  
**CL** clears worksheet but leaves formulae intact  
**SC** clears all data and formulae from sheet  
**PS** finds the progressive sum of the previous column  
**SORT** assembles values in a specified column in ascending order. Column to be sorted must be between "SORT FROM?" and "SORT TO?"  
**SAVE** saves program and data.

Don't forget to start recorder before pressing NEWLINE

**To move the cursor**  
**5** moves columns one to the left  
**8** moves columns one to the right  
**6** scrolls down one line  
**B** shows bottom 17 lines  
**T** returns to top 17 lines  
**LEFT** moves columns left by specifying column which is to be moved first  
**RIGHT** same as above, but to the right

**How it works**  
 On RUN you will be asked what you require. Typing 1 will give you a new worksheet without data or formulae and 2 or 3 will display figures and/or data formulae which may have been saved previously. After entering 1 you will be asked how many rows and columns you require. A vast amount of figures can be handled, so for example, you could ask for 30 rows, and 10 columns, with 3 columns displayed. The screen will then blank out, since it is running in fast mode. It returns after a few seconds with a displayed table. On the top right you will see how many rows and columns you have and the amount of free memory space. You can fill the columns with figures in two ways!

- 1 Using the V command, you can enter values into a specific column on each row where the " appears;
- 2 using the FORM command, you can fill a column using formula, e.g. R\*\*2, which prints the row number squared on each row of the columns

Change the column spacing using the CC command if you think the display is too full or empty by specifying the number of columns to be shown, when asked. If you use the CH command to change a value in a column, and that column has a formula, then you will be asked if you wish to retain that formula. Changing a value in a column overwrites that formula. If you change the figures in a column, this will affect results in another column, e.g. C3 = C1 + C2. The RR command will recalculate the new values.



### Examples of formulae

Formula	What it does	Terms used
$R/C1 + 3$	divides row no. by column no. then adds 3	R row number
$C1 + C2$	prints the sum of row in these columns and prints in column specified	C column in columnsheet
$C1 \times 1.1$	adds 10% to subsequent numbers in row in column 1	S sum of columns (NB: if you use this, you must already have found the sum of the column)
$C1/S1 + 5$	divides each row by the sum of this column then adds 5 (if the sum of the column has already been found)	S sum of columns

```

10 REM *** SPREADSHEET ***
20 CLY
30 PRINT "DO YOU WANT : 1 NEW
WORKSHEET
ED DATA
ED FORMULA
PROGRAM"
40 INPUT X$
50 CLS
60 IF X$="2" THEN GOTO 1390
70 IF X$="3" THEN GOTO 2340
80 IF X$="4" THEN STOP
90 PRINT AT 0,0;"NO OF ROWS RE
QUIRED"
100 INPUT N1
110 LET N=N1+1
120 PRINT AT 0,0;"NO OF COLUMNS
REQUIRED"
130 INPUT M
140 PRINT AT 0,0;"HOW MANY COLU
MNS ON DISPLAY?"
150 DIM A$(M,50)
160 DIM H$(M,6)
170 DIM Q(N,M)
180 DIM C(N)
190 LET M$=""
200 LET T=0
210 FOR U=1 TO C1
220 LET C(U)=(U*INT (30/C1)-INT
(21/C1)+1)
230 NEXT U
240 IF M$="CC" THEN GOTO 1390
250 LET J=0
260 LET K=0
270 LET S=0
280 IF M$="T" THEN GOTO 1390
290 LET L=N1
300 LET S=0
310 IF L>17 THEN LET L=17
320 PRINT AT 2,0
330 FOR X=1 TO L
340 LET S=S+1
350 PRINT S
360 NEXT X
370 PRINT AT 0,0;"COMMAND?
" N1, "R", "M, "C" ", INT
((PEEK (16336)+PEEK (16367)*25
5)-(PEEK (16412)+PEEK (16413)*25
5))/10+.5)/100,"K"
380 PRINT "-----"
390 FOR C=1 TO C1
400 PRINT AT 1,(C*INT (30/C1))-
INT (12/C1),"C";C-T
410 NEXT C
420 IF M$="CL" THEN GOSUB 980
430 INPUT M$
440 PRINT AT 0,0,"
450 IF M$="T" AND N1<18 OR M$="
B" AND N1<18 THEN GOTO 370
460 IF M$="T" THEN GOTO 250
470 IF M$="S" OR M$="B" OR M$="
B" THEN GOTO 1340
480 IF M$="RIGHT" OR M$="LEFT"
THEN GOTO 1550
490 IF M$="6" THEN GOTO 2170
500 IF M$="SORT" THEN GOTO 2520
510 IF M$="FORM" THEN GOTO 1800
520 IF M$="RR" THEN GOTO 1750
530 IF M$="SUM" THEN GOTO 980
540 IF M$="U" THEN GOTO 830
550 IF M$="HEAD" THEN GOTO 800

```

```

555 IF M$="PS" THEN GOTO 1140
560 IF M$="CC" THEN GOTO 1180
570 IF M$="CH" THEN GOTO 1170
580 IF M$="CL" THEN GOTO 2340
590 IF M$="SC" THEN GOTO 10
600 IF M$="EXIT" THEN STOP
610 IF M$="SAVE" THEN GOTO 283
620 IF M$<>"5" THEN GOTO 370
630 REM **C COMMAND**
640 PRINT AT 0,0;"GIVE COLUMN N
O"
650 INPUT C
660 PRINT AT 0,0;"GIVE VALUES
670 LET U=C+T
680 FOR R=1 TO N1
690 LET R1=R-K
700 LET A$(C)="0(R,C)"
710 IF R1<1 THEN GOTO 730
720 PRINT AT R1+2,C(U);" "
730 INPUT Q(R,C)
740 IF R1<1 THEN GOTO 760
750 GOSUB 2430
760 IF R=N1 THEN GOTO 370
770 IF R1<16 THEN GOSUB 2100
780 NEXT R
790 GOTO 370
800 REM ** COLUMN HEADINGS **
810 PRINT AT 0,0;"COLUMN NUMBER
"
820 INPUT C
830 LET U=C+T
840 PRINT AT 0,0;"COLUMN HEADIN
G"
850 INPUT H$(C)
860 IF U<1 OR U>C1 THEN GOTO 80
0
870 GOSUB 2460
880 PRINT AT 0,0;"COMMAND?
890 GOTO 430
900 PRINT AT 0,0;"
910 FOR C=ABS T+1 TO ABS T+C1
920 IF C>M THEN RETURN
930 IF H$(C,1 TO 2)=" " THEN G
OTO 960
940 LET U=C+T
950 GOSUB 2460
960 NEXT C
970 RETURN
980 REM **SUM COMMAND**
990 PRINT AT 0,0;"GIVE COLUMN N
O TO BE SUMMED"
1000 INPUT C
1010 LET U=C+T
1020 LET Q(N,C)=0
1030 FOR R=1 TO N1
1040 LET Q(N,C)=Q(N,C)+Q(R,C)
1050 NEXT R
1060 IF U<1 OR U>C1 THEN GOTO 10
90
1070 GOSUB 2490
1080 IF M$="RR" THEN GOTO 1600
1090 GOTO 370
1100 REM **CC COMMAND**
1110 PRINT AT 0,0;"NO OF COLUMNS
ON DISPLAY?"
1120 INPUT C1
1130 GOTO 210
1140 REM **PS COMMAND**
1150 LET A$(C)="0(R,C-1)+(R<>1)*
Q(R-1+(R<>1),C)"
1160 GOTO 1660
1170 REM **CH COMMAND**
1180 LET X$="N"
1190 PRINT AT 0,0;"GIVE COLUMN N
UMBER"
1200 INPUT C
1210 IF A$(C,1 TO 6)<>"0(R,C)" A
ND A$(C,1 TO 2)<>" " THEN PRINT
AT 0,0;"KEEP FORMULA IN THIS CO
LUMN" \N"
1220 IF A$(C,1 TO 2)<>" " AND A
$(C,1 TO 6)<>"0(R,C)" THEN INPUT
X$
1230 IF X$="Y" THEN GOTO 370
1240 PRINT AT 0,0;"GIVE ROW NUMB
ER"
1250 INPUT R
1260 LET R1=R-K
1270 LET U=C+T
1275 PRINT AT 0,0;"GIVE NEW NUMB
ER"
1280 INPUT Q(R,C)
1290 LET A$(C)="0(R,C)"

```



```

1300 IF V<1 OR V>C1 OR R1<1 OR R
1>17 THEN GOTO 1320
1310 GOSUB 2430
1320 IF @ (N,C) <> 0 THEN GOTO 1020
1330 GOTO 370
1340 REM **CURSOR MOVE**
1350 IF M$="8" THEN LET T=T-1
1360 IF M$="5" THEN LET T=T+1
1370 IF M$="B" THEN LET K=N1-17
1380 IF M$="B" THEN LET S=N1
1390 CLS
1400 FOR C=ABS T+1 TO ABS T+C1
1410 IF C>M THEN GOTO 1520
1420 LET U=C+T
1430 IF H$(C,1 TO 2) <> " " THEN
GOSUB 2460
1440 IF A$(C,1 TO 2) = " " THEN G
OTO 1510
1450 FOR R=ABS K+1 TO ABS K+L
1460 LET R1=R-K
1470 GOSUB 2430
1480 NEXT R
1490 IF @ (N,C) = 0 THEN GOTO 1510
1500 GOSUB 2490
1510 NEXT C
1520 IF M$="T" THEN GOTO 300
1530 LET S=S-L
1540 GOTO 320
1550 REM **LEFT COLUMN**
1560 PRINT AT 0,0;"GIVE FIRST CO
LUMN NUMBER"
1570 INPUT X
1580 LET T=1-X
1590 GOTO 1390
1600 REM **FORMULA ENTRY**
1610 PRINT AT 0,0;"GIVE COLUMN N
UMBER"
1620 INPUT C
1630 PRINT AT 0,0;"GIVE FORMULA

1640 INPUT A$(C)
1650 GOSUB 1900
1660 LET U=C+T
1670 FOR R=1 TO N1
1680 LET R1=R-K
1690 LET @ (R,C)=VAL A$(C)
1700 IF V<1 OR V>C1 OR R1<1 OR R
1>17 THEN GOTO 1720
1710 GOSUB 2430
1720 NEXT R
1730 IF A$(C,1) = "R" AND A$(C,2) =
" " THEN LET A$(C) = "@ (R,C)"
1740 IF @ (N,C) <> 0 THEN GOTO 1020
1750 GOTO 370
1760 REM **RR COMMAND**
1770 FOR C=1 TO M
1780 IF A$(C,1 TO 6) = "@ (R,C)" OR
A$(C,1 TO 2) = " " THEN GOTO 100
0
1790 LET U=C+T
1800 FOR R=1 TO N1
1810 LET R1=R-K
1820 LET X=@ (R,C)
1830 LET @ (R,C)=VAL A$(C)
1840 IF V<1 OR V>C1 OR R1<1 OR R
1>17 THEN GOTO 1860
1850 IF X <> @ (R,C) THEN GOSUB 243
0
1860 NEXT R
1870 IF @ (N,C) <> 0 THEN GOTO 1020
1880 NEXT C
1890 GOTO 370
1900 REM **FORMULA**
1910 LET X=1
1920 LET B$=A$(C)
1930 LET C$=""
1940 IF X=LEN B$+1 THEN GOTO 200
0
1950 IF B$(X) = "P" THEN GOTO 1140
1960 IF B$(X) <> "C" AND B$(X) <> "S
" THEN GOTO 2030
1970 LET X$="R"
1980 IF B$(X) <> "C" THEN LET X$="
N"
1990 IF B$(X+2) = "+" OR B$(X+2) = "
/" OR B$(X+2) = "++" OR B$(X+2) = "+
" OR B$(X+2) = "-" THEN GOTO 2050
2000 LET C$=C$+"@ (" + X$ + " , " + B$(X+
1 TO X+2) + ")"
2010 LET X=X+3
2020 GOTO 1940
2030 LET C$=C$+B$(X)
2035 LET X=X+1

```

```

2040 GOTO 1940
2050 LET C$=C$+"@ (" + X$ + " , " + B$(X+
1) + ")"
2060 LET X=X+2
2070 GOTO 1940
2080 LET A$(C) = C$
2090 RETURN
2100 REM **SCROLL ROUTINE**
2110 IF R1+2>N THEN RETURN
2120 LET K=K+1
2130 LET S=S+1
2140 PRINT AT 20,0;S
2150 SCROLL
2160 RETURN
2170 REM **SCROLL**
2180 LET J=J+1
2190 IF S=N1 OR R=N1 THEN GOTO 3
70
2200 LET R=17+J
2210 LET K=K+1
2220 LET S=S+1
2230 PRINT AT 20,0;S;TAB 3;"

2240 SCROLL
2250 FOR C=ABS T+1 TO ABS T+C1
2260 IF C>M THEN GOTO 430
2270 IF A$(C,1 TO 2) = " " THEN G
OTO 2320
2280 LET U=C+T
2290 PRINT AT 19,C(U);INT (@ (R,C
1+100+.5)/100)
2300 IF @ (N,C) = 0 THEN GOTO 2320
2310 GOSUB 2490
2320 NEXT C
2330 GOTO 430
2340 REM **CLEAR SPREADSHEET**
2350 CLS
2360 FOR C=1 TO M
2370 FOR R=1 TO N1
2380 LET @ (R,C) = 0
2390 NEXT R
2400 IF @ (N,C) <> 0 THEN LET @ (N,C
1) = .001
2410 NEXT C
2420 GOTO 250
2430 REM **PRINT**
2440 PRINT AT R1+2,C(U);(INT (@ (
R,C)+100+.5)/100);"
2450 RETURN
2460 REM **PRINT HEADINGS**
2470 PRINT AT 2,C(U);H$(C)
2480 RETURN
2490 REM **PRINT SUM ROUTINE**
2500 PRINT AT 20,C(U);(INT (@ (N,
C)+100+.5)/100);"

2510 RETURN
2520 REM **ASCENDING SORT**
2530 PRINT AT 0,0;"ENTER COLUMN
TO BE SORTED"
2540 INPUT C
2550 PRINT AT 0,0;"SORT FROM?"

2560 INPUT X
2570 PRINT AT 0,0;"SORT TO?"
2580 INPUT 0
2590 LET R=1
2600 IF 2++R>N1 THEN GOTO 2630
2610 LET R=R+1
2620 GOTO 2600
2630 LET F=2++R-1
2640 LET F=INT (F/2)
2650 IF F=0 THEN GOTO 1390
2660 LET D=N1-F
2670 LET B=1
2680 LET R=0
2690 LET E=R+F
2700 IF @ (R,C) > @ (E,C) THEN GOTO
2750
2710 LET B=B+1
2720 IF B>D THEN GOTO 2640
2730 GOTO 2680
2740 FOR U=X TO 0
2750 LET T1=@ (R,U)
2760 LET @ (R,U) = @ (E,U)
2770 LET @ (E,U) = T1
2780 NEXT U
2790 LET R=R-F
2800 IF R<1 THEN GOTO 2720
2810 GOTO 2690
2820 SAVE "SPREADSHEET"
2830 GOTO 1
2850 STOP

```



## 48K SPECTRUM PROGRAM

Given the power of the DUMP command as an aid to debugging, it is surprising to find that so few versions of BASIC possess it. DUMP is used to produce a list of some or all of the variables in memory at the time of calling; this is a facility which can make light work of the detection of programming errors which may otherwise be very difficult to find.

The DUMP routine presented here is written in machine code and is suitable for the 48K Spectrum. The listing is in BASIC and POKES the code directly into memory, after having verified that there are no errors in your data lines. If there are errors, the program will tell you where to look for them. Once the data has been validated and entered, you can save the machine code version of the VARIABLES DUMP to tape, using the file name "VARSDUMP".

The routine is called by entering "PRINT USR 64000". It is important to use the form "PRINT USR..." as any other method, such as "RANDOMIZE USR..." will fail to produce any output.

When called, the routine clears the screen and the words "DUMP OF VARIABLES" are printed. Below this are given the values of the non-subscripted variables, which are those set up by DIM statements, are ignored as they are often in a form unsuitable for dumping. Anyway, if you wish, it is quite easy to dump them through a small BASIC program, because of their subscripted names.

Ordinary variables are listed in the form: name of variable = value of variable. String variables are slightly altered from the form used in BASIC. The string is enclosed in single rather than double quotation marks. The reason for this is bound up in the method that the routine uses to print to screen. If you are keen on machine code programming, you may care to determine the precise justification for this change. In any case, when dumping a screen variable, the form used is: name of string = 'text of string'.

Control variables, i.e. those set up by FOR-NEXT loops, behave differently from ordinary numeric variables, so the routine distinguishes them by printing an asterisk before their labels. The dump would be: \*name of control variable = value of control variable.

# IT'S EASY TO FIND FAULT

*Solve all your programming problems with this machine code DUMP routine by Paul Murray. It gets to the heart of the matter and helps you locate errors*

If the screen is filled before all of the variables in memory have been listed, the word "MORE..." will appear and the computer will wait until a key is pressed before clearing the screen and continuing the dump.

Once all variables have been

printed out, the message "END OF DUMP" will appear, followed by an apparently random number which is meaningless for the purposes of this routine, and which can be ignored.

If the output for any variable should occupy more than one

line, the subsequent item may overwrite part of it. Should this happen, no harm will be done to your program or variables, but it is important to be aware of this limitation in the routine.

A sample program, together with its dump, is given below, illustrating many of the features described.

```
10 REM TEST PROGRAM
20 LET INT=15
30 LET K=1
40 LET REAL=5.37986
50 LET NEB=7.553
60 LET SCIENTIFIC=-3.9667E-17
70 LET AB="HELLO"
80 DIM B(1000)
90 DIM Z(20)
100 FOR N=1 TO 20
110 LET Z(N)=N
120 NEXT N
130 LET TIME=4.40
140 LET ZERO=0
150 LET MAXVAL=10
160 LET REAL1=3.1415926
170 LET DAY=31
180 LET COMPLEX=-1
190 LET STUDENTS=4933
200 LET HEIGHT=152
210 FOR M=1 TO 30
220 BEEP .01,M
230 NEXT M
240 FOR K=30 TO 1 STEP -1
250 BEEP .01,K
260 NEXT K
270 LET PH="COFFEE IS EXPENSIVE"
275 LET VB="BUT IT TASTES NICE"
280 LET TB="HELLO THERE"
290 LET UB="THIS IS ENOUGH"
300 PRINT USR 5E4
```

```
10 REM TEST PROGRAM
20 LET INT=15
30 LET K=1
40 LET REAL=5.37986
50 LET NEB=7.553
60 LET SCIENTIFIC=-3.9667E-17
70 LET AB="HELLO"
80 DIM B(1000)
90 DIM Z(20)
100 FOR N=1 TO 20
110 LET Z(N)=N
120 NEXT N
130 LET COST=56
140 LET NUMBER=8
150 LET MAXVAL=10
160 LET REAL1=3.1415926536
170 LET DAY=31
180 LET SINE=SIN (REAL1/6)
190 LET STUDENTS=4933
200 LET HEIGHT=152
210 FOR M=1 TO 30
220 BEEP .01,M
230 NEXT M
240 FOR K=30 TO 2 STEP -1
250 BEEP .01,K
260 NEXT K
270 LET TOTAL=COST*NUMBER
280 PRINT USR 64000
290 STOP
```

```
10 REM MC ENTRY PROGRAM
15 CLEAR 63999
20 LET L=64000
30 DIM A(256): DIM B(26,12)
40 FOR N=1 TO 26
50 READ A(N)
60 NEXT N
70 FOR M=1 TO 26
80 LET T=0
90 FOR N=1 TO 12
100 READ B(N,M)
110 LET T=T+B(N,M)
120 NEXT N
130 IF T=6(N) THEN GO TO 170
140 PRINT "ERROR IN DATA"
150 PRINT "CHECK LINE ";(10+M)+260
160 STOP
170 NEXT M
180 FOR M=1 TO 26
190 FOR N=1 TO 12
200 POKE L,B(N,M)
210 LET L=L+1
220 NEXT N
230 NEXT M
240 SAVE "VARSDUMP" CODE 64000,312
250 DATA 1551,780,1961,1839,1398,821,1598,1239,2321,1022,2219,1792,2226
260 DATA 1137,1740,2094,1713,1851,1799,1400,1544,1719,1165,1146,941,1220
270 DATA 205,27,251,205,192,250,68,65,77,80,37,79
280 DATA 70,52,86,65,82,75,65,66,76,69,85,15
290 DATA 305,240,250,42,75,93,147,253,203,71,156,229
300 DATA 237,75,89,92,11,237,66,225,210,221,250,126
310 DATA 230,224,6,5,31,16,253,254,7,40,79,254
320 DATA 5,40,57,254,3,40,17,254,2,40,79,33
330 DATA 78,35,70,35,9,24,207,205,211,250,229,205
340 DATA 192,250,61,13,225,1,5,0,17,146,92,237
350 DATA 176,229,239,224,56,205,227,65,205,240,250,225
360 DATA 255,203,71,70,40,172,1,13,0,9,24,166
370 DATA 205,211,250,126,203,191,229,215,225,126,35,203
380 DATA 127,40,244,24,201,229,205,192,250,42,13,225
390 DATA 253,203,71,198,24,185,205,211,250,229,205,192
400 DATA 250,36,61,39,13,225,78,35,70,35,120,177
410 DATA 40,9,126,229,197,215,193,225,11,24,242,229
420 DATA 205,192,250,39,13,205,240,250,225,195,30,250
430 DATA 225,126,229,215,225,35,229,126,254,13,32,4
440 DATA 225,55,229,201,215,24,241,126,230,51,198,96
450 DATA 229,215,225,35,201,205,192,250,69,78,68,52
460 DATA 79,70,32,68,85,77,80,13,205,240,250,201
470 DATA 253,54,78,0,253,53,79,255,126,79,245,71
480 DATA 305,115,14,38,132,92,241,254,3,192,205,192
490 DATA 250,77,79,82,69,46,46,46,13,253,203,5
500 DATA 174,255,203,1,110,40,250,35,0,64,17,1
510 DATA 64,1,255,23,34,0,237,176,33,0,64,34
520 DATA 132,92,253,54,78,0,253,54,79,24,201,0
1000 FOR N=64236 TO 64400
1010 LET a=PEEK N
1020 LET b=INT (a/16)
1030 LET c=a-16*b
1040 LET b=STR$ b
1050 LET c=STR$ c
1060 IF b>9 THEN LET b=CHR$ (55+b)
1070 IF c>9 THEN LET c=CHR$ (55+c)
1080 PRINT N;" " ;b;c
1090 NEXT N
```



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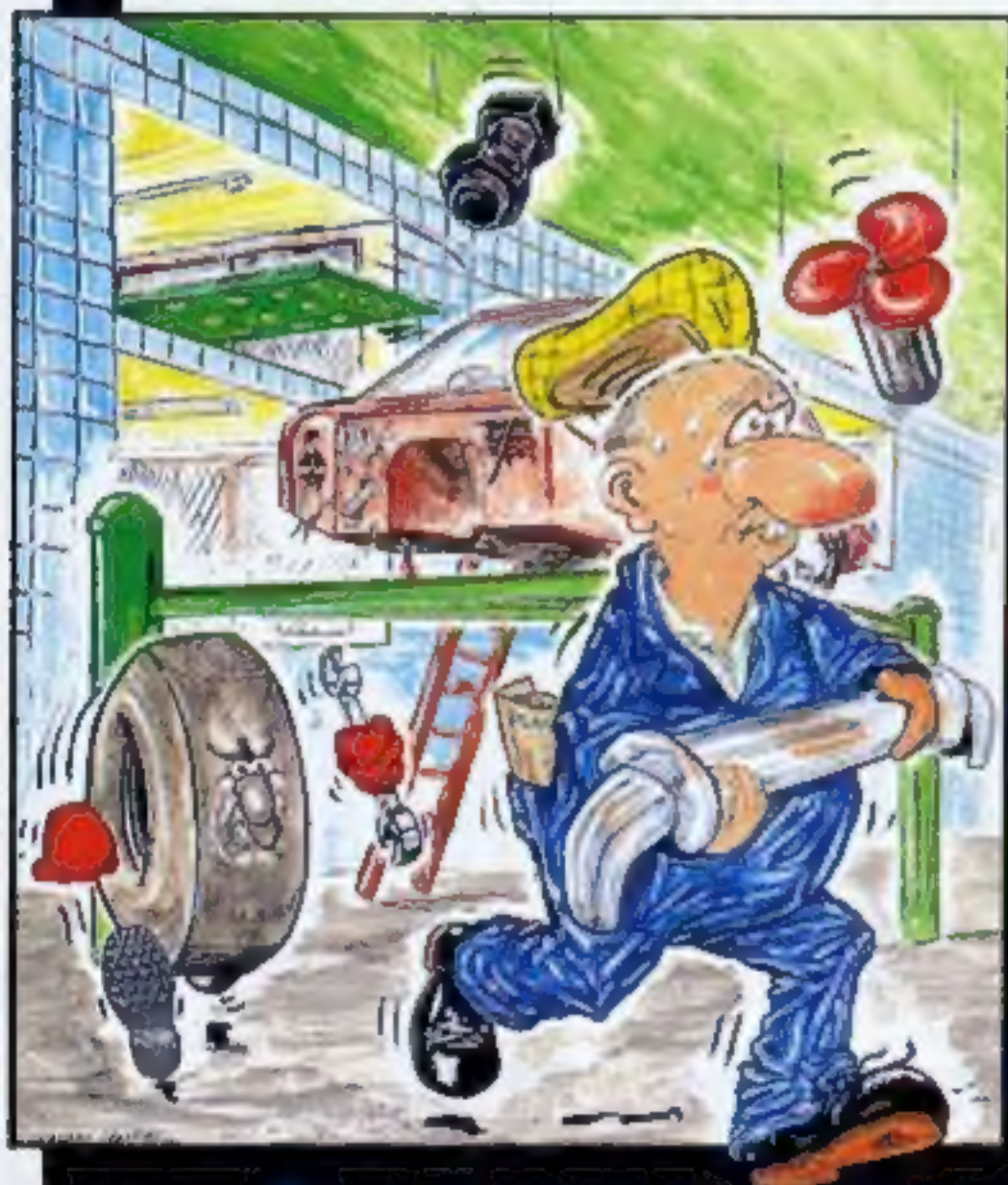
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